

11882995

ISBN 0-671-62130-0

1962  
cont

Walter M. Schirra orbits Earth six times on Oct 3 in his Mercury spacecraft *Sigma 7*

1963

US President John F. Kennedy is assassinated

Ice age skeletons found in the Romito cave near Cosenza, Italy, include that of a dwarf; later analysis suggests that the 17-year-old dwarf was accepted by the hunter-gatherers despite the fact that he could not have contributed much to the community

Lascaux cave, home of the most famous cave paintings, dating back 17,000 years, is closed to the public to prevent damage to the art caused by the increased humidity from people's breath

Herbert Friedman directs the launch of a satellite to study X rays from space

Friedman and his group at the US Naval Research Laboratory identify Sco X-1 as a strong X-ray source in Scorpio

Seth Barnes Nicholson, American astronomer, d Los Angeles, CA, Jul 2

Allan Sandage discovers that the galaxy M82 is undergoing a massive explosion at its center, one that is believed to have been in progress for 1.5 million years

Dutch-American astronomer Maarten Schmidt (b Groningen, Netherlands, Dec 28, 1929) reports his discovery of the extraordinarily large red shift of the object 3C273; the red shift corresponds to a recession velocity of 47,400 km (29,400 mi) per second, and constitutes the first recognition of a quasar

Otto Struve, Russian-American astronomer, d Berkeley, CA, Apr 6

Syncom 2, launched on Feb 14, becomes the first artificial satellite to go into a geosynchronous orbit; that is, an orbit that is matched to Earth's rotation so that the satellite stays directly above one location on Earth's surface

Sir John C. Eccles of Australia and Alan Lloyd Hodgkin and Andrew F. Huxley of England win the Nobel Prize for Physiology or Medicine for their study of the mechanism of transmission of neural impulses

David Keilin, Russian-British biochemist, d Cambridge, England, Feb 27

Carl Sagan (b New York, NY, Nov 9, 1934) detects adenosine triphosphate (ATP), an important biochemical used in storing energy, in a mixture of chemicals that reflects what are thought to be the early conditions on Earth

Giulio Natta of Italy and Karl Ziegler of Germany win the Nobel Prize for Chemistry for their synthesis of polymers for plastics

1962  
cont

F.J. Vine and D.H. Matthews show that the residual magnetism of the floor of the Indian Ocean changes polarity in a periodic fashion, convincing evidence that sea-floor spreading has occurred; since Earth's magnetic field reverses from time to time, the magnetic "stripes" also indicate the rate of spreading

Paul J. Cohen shows that Cantor's continuum hypothesis is independent of the axioms of set theory; this means that there are at least two types of mathematics possible—one that says that the continuum hypothesis is true and one that says it is false

Herbert Spencer Gasser, American physiologist, d New York, NY, May 11

Nicola Cabibbo develops a theory of weak interactions that indirectly leads to the electroweak theory that is accepted today

Theodore von Karman, Hungarian-American physicist, d Aachen, W Germany, May 7

Eugene Paul Wigner and Maria Goeppert Mayer of the United States and J. Hans D. Jensen of Germany share the Nobel Prize for Physics, Wigner for the mechanics of proton-neutron interaction and Mayer and Jensen for their theory of nuclear structure

Friction welding is invented

The cassette for recording and playing back sound is introduced by Philips of the Netherlands

Semiconductor diodes that use electron tunneling go on sale, only six years after the tunneling effect was discovered by Leo Esaki

1963

Quasars

Many scientific discoveries have put an idea scientists had—a theory—on a stronger footing. Examples are the discovery of the cosmic background radiation which turned out to be a confirmation of the Big-Bang theory, and the discovery of pulsars, which made reality of the idea of neutron stars. The discovery of quasars, however, only caused bewilderment among astronomers. The consequence of this discovery was that one either had to question the validity of the yardstick of the astronomer, the red shift, or to agree that there are processes out there for which we have no explanation at all.

During the 1950s, radio astronomers discovered a number of very compact radio sources. Because radio telescopes at that time could not pinpoint celestial objects very accurately, it was difficult to find these objects with a telescope. One of these compact sources, known as 3C273, was occulted by the moon in 1962 and its exact position could be established. Photos taken with the 5-m Hale (200-in.) telescope at Mt. Palomar showed a star-like object at that position. However, its spectrum was unusual: it contained absorption lines that could not be identified. It, and later others like it, was called a quasi-stellar radio source, or quasar for short.

In 1963 Maarten Schmidt discovered that the absorption lines in the spectrum of 3C273 were common ones, but shifted towards the red end of the spectrum

by an extraordinary amount. During the following years astronomers discovered a large number of quasars with large red shifts.

It was commonly held among astronomers that the red shifts observed in the spectra of extragalactic systems are Doppler shifts caused by velocity these systems have because they participate in the expansion of the universe (see "The size of the universe," p 440). Red shifts caused by the expansion of the universe are called cosmological red shifts. If the red shifts of quasars are cosmological, the quasars must be at extraordinary distances, making them the farthest objects ever observed in the telescope. Because they can be observed over such distances, their energy output must be enormous.

Not all astronomers, however, believe that quasars have cosmological red shifts. The American astronomer Halton Arp has discovered a number of systems consisting of a quasar and a galaxy that seem to be physically connected but exhibit very different red shifts in their spectra. He therefore argues that some still unknown mechanism other than the expansion of the universe must cause these red shifts. Most astronomers believe that quasars have cosmological red shifts and that the systems discovered by Arp only appear to be connected, and that they, in reality are at very different distances from Earth.

A typical two-page spread from *The Timetables of Science*™  
(reduced in size from the actual pages)

